Funded Research Projects for FY 94-95

TITLE: Bioscience Research Center

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Don Mathre

AMOUNT FUNDED: $200,000

OBJECTIVES:

1) Provide financial support for the construction and/or equipping of the Bioscience Research Center which will be an addition to the Plant Growth Center.

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TITLE: Development of Improved Barley Cultivars for Montana

INSTITUTION: Montana State University

DEPARTMENT: Plant and Soil Sciences

RESEARCHERS: Tom Blake

COOPERATORS:

AMOUNT FUNDED: $60,000

OBJECTIVES:

1) To continue the development of low-input, improved feed quality 2-rowed barley varieties for Montana.

2) To continue the initial development of an entirely novel class of malting barley varieties.

3) To release MT860756 (feed) and MT140523 (malt) if industry approves and conditions warrant.

4) To test all reasonable barley and oat lines for recommendation to Montana small grains producers.

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TITLE: Winter Wheat Breeding/Genetics

INSTITUTION: Montana State University

DEPARTMENT: Plant and Soil Sciences

RESEARCHERS: Phil Bruckner

COOPERATORS: Doug Holen and Lou Kuifu

AMOUNT FUNDED: $60,000

OBJECTIVES:

1) Develop improved cultivars of winter wheat adapted to Montana climatic conditions and cropping systems, which possess superior grain yield potential, winterhardiness, adequate and durable pest resistance, stress tolerance, superior agronomic characteristics, and end-use qualities.

2) Advance early-generation segregation bulk populations and evaluate derived lines at Research Center locations under heavy natural and enhanced selection pressure for winter survival, and wheat stem sawfly, wheat streak mosaic virus (WSMV), Russian wheat aphid (RWA), and stem rust resistance to identify and select favorable plant types for further testing.

3) Investigate environmental, genetic, and management factors which influence wheat productivity and end-use in Montana including 1994 projects: incorporation of new sources of stem solidness and WSMV, genetic diversity in sawfly populations,genotypic variability for preharvest sprouting susceptibility,critical winter wheat overwinter survival, and wheat gene pool relationships to guide hybridization strategy.

4) Coordinate Montana statewide winter wheat variety testing program and provide longterm performance data necessary for cultivar release decisions, variety recommendations, and producer management decisions.

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TITLE: Spring Wheat Breeding and Genetics

INSTITUTION: Montana State University

DEPARTMENT: Plant and Soil Sciences

RESEARCHERS: Luther Talbert and Susan Lanning

COOPERATORS: Charles McGuire and Jack Martin

AMOUNT FUNDED: $60,000

OBJECTIVES:

1) To develop spring wheat varieties for Montana. In particular,we are developing varieties with the following attributes:

a) Sawfly resistant varieties with superior agronomic and end-use properties.
b) Other varieties for Eastern Montana.
c) Hard white spring wheat varieties for Montana.
d) Varieties with combinations of the above attributes.

2) To manage the varietal testing program for spring wheat in Montana.

3) To improve the end-use quality of Montana spring wheat.

4) To provide information and materials to insure the longterm productivity of the Montana spring wheat breeding program.

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TITLE: Evaluation of various materials and practices contributing toward economic crop production under flexible, continuous and other cropping systems in Montana

INSTITUTION: Montana State University

DEPARTMENT: Ag Experiment Station Research Centers

RESEARCHERS: Research faculty members at the following Research Centers:

1) Central Ag Research Center, Moccasin
2) Eastern Ag Research Center, Sidney
3) Northern Ag Research Center, Havre
4) Northwestern Ag Research Center, Kalispell

5) Southern Ag Research Center, Huntley
6) Western Triangle Ag Research Center, Conrad

COOPERATORS:

AMOUNT FUNDED: $60,000

OBJECTIVES:

1) To evaluate the effects of differing systems on crop and variety performance under diverse environments represented across the Montana Ag Experiment Station - Research Center network.

2) To evaluate the potential fit of other materials, concepts and techniques with various cropping systems employed.

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TITLE: Consolidation of the Plant, Soil and Environmental Science Cereal Quality and Nutrition Laboratories

INSTITUTION: Montana State University

DEPARTMENT: Plant and Soil Sciences

RESEARCHERS: C. Walt Newman and Rosemary K. Newman

COOPERATORS: Thomas McCoy

AMOUNT FUNDED: $53,000

OBJECTIVES:

1) Identification, justification and purchase of laboratory equipment necessary for the establishment of state-of-the-art laboratory for the purpose of research and development with Montana cereal crops.

2) Develop a descriptive brochure of the proposed consolidated laboratory to be used in advertising, promotion and fund raising campaigns for maintenance and continued support of the new facility.

3) Determine the space requirements layout and design for the consolidated laboratory.

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TITLE: Developing Methods for Prevention and Control of the Wheat Curl Mite and Wheat Streak Mosaic Virus

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Dr. Jack Riesselman, Dr. Greg Johnson, Dr. Sue Blodgett, Dr. Phil Bruckner, and Dr. Luther Talbert

COOPERATORS:

AMOUNT FUNDED: $44,000

OBJECTIVES:

1) Varietal evaluations of wheat streak mosaic (WSM) tolerance
   A. Determine the yield of Montana's predominant spring and winter wheat lines when naturally infected with WSMV.
   B. Evaluate WSMV severity in line rows of Judith, Winalta and Sawfly resistant lines that exhibited tolerance in 1993.

2) Entomological Investigations
   A. Identify and determine the relative importance of oversummering reservoirs for (WCM) wheat curl mite and WSMV.
   B. Evaluate cultivar resistance to the WCM and correlate this to WSMV reactions utilizing symptomology and yield parameters.
   C. Ascertain efficacy of soil applied insecticies.

3) Cereal breeding program
   A. Identify molecular markers for WSM 1, resistant gene for WSMV and transfer the gene into adapted Montana winter and spring wheats by conventional and molecular techniques.

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TITLE: Wheat Stem Sawfly Management

INSTITUTION: Montana State University

DEPARTMENT: Entomology and Plant and Soil Sciences

RESEARCHERS: Wendell Morrill, Gregory Kushnak, and Phil Bruckner

COOPERATORS: Dean Folkvord, Three Forks, MT
Jim Smelzer, Power, MT
Leo Somerfeld, Power, MT
Dr. Anwar Abd-Elfattah, Richmond, VA

AMOUNT FUNDED: $42,000

OBJECTIVES:

1) Identify active compounds in oats that kill sawflies.

2) Monitor sawfly resistance in solid stemmed winter wheat.

3) Determine effects of juvenile hormones on sawfly biology.

4) Monitor activity of parasites that attack sawflies.

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TITLE: Value-Added Processing and Product Development for Montana Wheat and Barley

INSTITUTION: Montana State University

DEPARTMENT: Plant and Soil Sciences

RESEARCHERS: Rosemary K. Newman and C. Walt Newman

COOPERATORS: Dr. Dale R. Clark, Dr. R. Tom Ramage, and Dr. Phil Bruckner

AMOUNT FUNDED: $42,000

OBJECTIVES:

1) To investigate the use of Hard White Winter Wheat (HWWW), separately and in combination with selected barley flour and vital wheat gluten for foods directed toward export markets.

2) To develop food uses for high-amylose barley for application in snack foods with glucose-lowering properties. (We are seeking co-funding from Ross Laboratories, Columbus OH

and ConAgra, Omaha NE.)

3) To explore the use of a concentrated barley (Barley Trim) in food products.

4) To determine the effects of various processing techniques on chemical composition and physical properties of selected wheat and barley cultivars.

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TITLE: Acquisition of Cereal Grain Plot Combine

INSTITUTION: Montana State University

DEPARTMENT: Northwestern Ag Research Center

RESEARCHERS: Leon E. Welty and Bob Stougaard

COOPERATORS:

AMOUNT FUNDED: $25,000

OBJECTIVES:

1) Obtain cereal plot combine with the technology to acquire grain yield, percent grain moisture, and test weight data in the field.

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TITLE: Impact of Plant Disease on the Ability of Producers to Comply With the Residue Compliance Program

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Don Mathre, Bill Grey, and Greg Kushnak

COOPERATORS: Jack Martin, Bob Johnston, Luther Talbert, Phil Bruckner, and Tom Blake

AMOUNT FUNDED: $21,000

OBJECTIVES:

1) Determine the effect of residue conservation on the development and impact of plant disease on spring wheat and barley production.

2) Determine the susceptibility of currently grown winter wheat,spring wheat, and barley cultivars to residue-borne pathogens.

3) Evaluate the lines of winter wheat, spring wheat, and barley currently under development for their disease reaction to residue-borne pathogens.

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TITLE: Control of Cereal Rusts in Montana

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology

RESEARCHERS: Dr. Mareike R. Johnston

COOPERATORS: Dr. Luther Talbert and Dr. Phil Bruckner

AMOUNT FUNDED: $20,200

OBJECTIVES:

1) Stem rust: Maintain and improve levels of stem rust resistance in Montana spring and winter wheat cultivars and breeding lines.

2) Stripe rust: Maintain levels of stripe rust resistance in all spring wheat cultivars recommended for the western part of the state. Incorporate and improve stripe rust resistance of winter wheats recommended for the same area. Localize known resistance genes against stipe rust of barley. Incorporate resistance into Montana adapted materials.

3) Survey virulence of naturally occurring races of stem and stripe rust on wheat and barley.

4) Collect and preserve large amounts of inoculum for use in screening nurseries and greenhouse work for both pathogens.

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TITLE: Russian Wheat Aphid: Development of Small Grain Resistant Varieties and Impact on Drought Stressed Grains

INSTITUTION: Montana State University

DEPARTMENT: Entomology and Plant and Soil Sciences

RESEARCHERS: Dr. Greg Johnson, Dr. Phil Bruckner, Dr. Luther Talbert and Dr. Tom Blake

COOPERATORS: Mark McLendon, Susan Lanning and Rhoda Burrows

AMOUNT FUNDED: $20,000

OBJECTIVES:

1) Cereal Breeding Programs
   A. Develop RWA-resistant winter wheat cultivars that are adapted to Montana.
   B. Develop RWA-resistant spring wheat cultivars that are adapted to Montana.
   C. Develop RWA-resistant barley cultivars adapted to Montana.

2) Entomological Investigations
   A. Determine the effects of RWA on water stressed spring grains.

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TITLE: Control of Cereal Rusts in Montana

INSTITUTION: Montana State University

DEPARTMENT: Plant Pathology and Plant and Soil Sciences

RESEARCHERS: Dr. Mareike R. Johnston

COOPERATORS: Dr. Luther Talbert and Dr. Phil Bruckner

AMOUNT FUNDED: $18,000

OBJECTIVES:

1) Stem rust: Maintain and improve levels of stem rust resistance in Montana spring and winter wheat cultivars and breeding lines. Provide barley breeding program with sources of resistance to stem rust.

2) Stripe rust: Maintain levels of stripe rust resistance in all spring wheat cultivars recommended for the western part of the state. Incorporate and improve stripe rust resistance of winter wheats recommended for the same area. Localize known resistance genes against stripe rust of barley. Incorporate resistance into Montana adapted materials.

3) Survey virulence of naturally occurring races of stem and stripe rust on wheat and barley.

4) Collect and preserve large amounts of inoculum for use in screening nurseries and greenhouse work for both pathogens.

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TITLE: Effect of Chloride Fertilization on Spring and Winter Wheat Varieties

INSTITUTION: Montana State University

DEPARTMENT: Southern and Eastern Ag Research Centers

RESEARCHERS: Richard Engle and Joyce Eckhoff

COOPERATORS:

AMOUNT FUNDED: $17,200

OBJECTIVES:

1) To determine the effect of Cl fertilization on grain yield, kernel weight, rate of kernel growth, and grain-till duration in several spring and winter wheat varieties under a wide range of environments.

2) To determine the effect of Cl on leaf diseases and disease-like symptoms in wheat.

3) To provide a Cl fertilizer recommendation program to Montana producers by developing a data-base on yield response frequency to Cl as affected by soil and plant Cl levels.

4) To determine if Cl fertilizer can enhance production of durum and barley.

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TITLE: Effect of Starch Digestion Rate on Feedlot Performance and Site of Starch Digestion by Beef Calves Fed High Concentrate Diets

INSTITUTION: Montana State University

DEPARTMENT: Animal and Range Sciences

RESEARCHERS: Janice Bowman

COOPERATORS: John Paterson, Tom Blake, Ken Bryan and Tim Milner

AMOUNT FUNDED: $14,200

OBJECTIVES:

1) To evaluate feedlot performance of cattle consuming high grain diets differing in rate of starch digestion.

2) To evaluate site and efficiency of starch digestion in beef calves consuming high grain diets differing in rate of starch digestion.

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TITLE: Evaluation of Genetic Diversity Measures in Wheat

INSTITUTION: Montana State University

DEPARTMENT: Plant and Soil Sciences

RESEARCHERS: John M. Martin

COOPERATORS: Luther Talbert

AMOUNT FUNDED: $12,500

OBJECTIVES:

1) Construct measures of diversity among spring wheat parents based on a) agronomic and quality traits; b) kinship

coefficients; and c) molecular markers.

2) Increase the seed of about 50 progeny lines from each of 12 crosses to be used in a replicated field trial in the following field season.

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TITLE: Analysis of Factors Influencing Montana Wheat and Barley Producers Consideration of Alternative Uses For CRP Lands When Contracts Expire

INSTITUTION: Montana State University

DEPARTMENT: Sociology and Ag Economics

RESEARCHERS: John Saltiel, James B. Johnson and John Antle

COOPERATORS:

AMOUNT FUNDED: 7,500

OBJECTIVES:

The focus of this research is on the incorporation of survey data on post-contract intentions of CRP contract holders in models designed to predict what Montana contract holders' post-contract decisions will be. Specifically, we propose to:

1) Analyze the intentions of current Montana CRP contract holders for disposition of lands when contracts expire. These estimates will be contrasted with estimates of intentions obtained in previous years.

2) Identify the resource endowment characteristics of contract holders which are most likely to have an effect on post-contract land use decisions. Evaluate the role of net returns to lands on post-contract land use decisions.

3) Specify and test models of the post-contract decision making process.

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TITLE: Computer System for Small Grain Variety Information

INSTITUTION: Montana State University

DEPARTMENT: Agronomy and Plant and Soil Sciences

RESEARCHERS: Gregg R. Carlson

COOPERATORS: Howard F. Bowman, Patrick F. Hensleigh and Will Lanier

AMOUNT FUNDED: $6,750

OBJECTIVES:

1) To develop a functional prototype computer system providing small grain variety information and decision support assistance.

2) To demonstrate and test the system with research, extension,and agribusiness personnel and key producer clientele.

3) To evaluate the potential for subsequent future distribution of a refined system package.

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TITLE: Legumes As Fallow Replacement in Rotation With Dryland Spring Wheat and Safflower

INSTITUTION: Montana State University

DEPARTMENT: Eastern Ag Research Center

RESEARCHERS: Dr. Joyce L. A. Eckhoff, Dr. Jerald W. Bergman

COOPERATORS:

AMOUNT FUNDED: $6,000

OBJECTIVES:

1) To evaluate common yellow sweet clover and black medic as a source of nitrogen for dryland spring wheat and safflower.

2) To evaluate common yellow sweet clover and black medic as a ground cover following harvest of dryland spring wheat and safflower.

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TITLE: Comparison of Hard Red or Hard White Winter Wheat, Winter Spelt and Winter Triticale for Protein Quantity and Quality as Affected by Growing Season Environment

INSTITUTION: Montana State University

DEPARTMENT: Agronomy

RESEARCHERS: Gil Stallknecht and Ken Gilbertson

COOPERATORS: Gregg Carlson, Joyce Eckhoff, Greg Kushnak, David Wichman, Pat Carr, Neil Riveland, Al Schneiter, Anthony Thilmony, and Steve Zwinger

AMOUNT FUNDED: $4,500

OBJECTIVES:

1) To compare the percent grain protein of hard red, hard white winter wheat, winter spelt, and winter triticale when grown under differing growing environments.

2) To compare the individual amino acid components of the protein from the winter cereal crops as affected by growing environments.

3) To develop a protein quality and quantity data base that can be used to accurately compare crops for comparative nutritional values.

4) To establish winter hardiness parameters for the alternate cereals.

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TITLE: Fall Seed Dormancy in Barley

INSTITUTION: Montana State University

DEPARTMENT: Agronomy

RESEARCHERS: David M. Wichman

COOPERATORS: Gregg R. Carlson, Greg D. Kushnak, Pat F. Hensleigh

AMOUNT FUNDED: $2,000

OBJECTIVE:

To determine the relative post harvest seed dormancy of barley varieties.